

Math 1  
Module 4 Group Project

In this project, your entire group will work together to explore a real-world problem and apply some mathematical modeling to the problem. You will do some background research, then prepare a written summary, a colorful graph, and a bibliography. After that, one of you will give a presentation to the class. Start out by choosing one of the problems, then begin research as indicated. As you research, you will decide roles for each group member: One will prepare the written summary, one will prepare the graph and bibliography, and one will prepare and give the oral presentation.

- (1) Writer: Your written summary should be one page, in 10- or 12-point size, using an easily readable font, automatic (black) font color, one-inch margins, double spaced, with no additional space between paragraphs. Use only one line for the title and group name. In your summary, describe what you found interesting in the research and describe the process your group used in modeling. Include the recursive or explicit model(s). Coordinate with the graphic artist regarding the bibliography.
- (2) Graphic Artist: Your graph should have a reasonable domain and range, take up a full sheet of graph paper, have axis labels, scales, and a title. Use color. If more than one model is shown on the same graph, use a graph key. On the back of the graph, include a bibliography in APA format listing any reference you used other than the links provided in the instruction. Be sure to include references that may be linked from the sites in the instructions.
- (3) Orator: Your presentation should be 4-6 minutes. You should provide a brief summary of your research and your model. Use the graph as a visual aid for the presentation. Tell what was difficult about the project, or what you learned that you did not know.

The project options are as follows:

**Car Valuation.**

- (1) Look over background information on depreciation of cars:  
<http://auto.howstuffworks.com/under-the-hood/cost-of-car-ownership/car-depreciation.htm>  
and  
<http://www.bankrate.com/finance/auto/car-depreciation-models-lose-value-1.aspx>  
Get a feel for how and why depreciation works, and how much the car depreciates.
- (2) Choose a car (new or used), then find some information about how much that car costs and how quickly it depreciates. Develop an exponential model for the value of the car over time.
- (3) Some new cars come with special financing deals, such as “0% interest for 60 months.” With that deal, each payment is  $1/60$  of the price of the car (after making a down payment). Develop a linear model for the amount you owe.
- (4) Plot the value of the car (your depreciation model) and the amount owed on the same axes. You will have to be careful about units on the horizontal axis: Will you use months or years? Adjust your models if necessary to make sure they use the same input variable.
- (5) Do your models ever result in your owing more than the car is worth? How would that show up on the graph? Recently, a car company advertised 0% for 84 months. How would that change the situation?

### Credit Card Debt.

- (1) Read two articles from the New York Times archives:  
<http://www.nytimes.com/2009/01/06/your-money/credit-and-debit-cards/primercards.html>  
and  
<http://bucks.blogs.nytimes.com/2011/12/29/impatient-it-may-be-hurting-your-credit-score>  
to get some background information about credit cards and credit scores.
- (2) Find out a current credit card's interest rate. (You can ask your parents, or use a search engine; **bankrate.com** offers an "average" interest rate for the last several months.) Make sure you use a typical interest rate rather than an "introductory" rate or a rate for high credit scores. If you can find information about the card's minimum payment policy, use that. Otherwise, divide the interest rate by 12 and round up to the nearest whole percent.
- (3) Go "shopping": Find some items online that you would like to buy if you had enough money. Record the items you "bought" and how much you spent. The total amount that you spend (using your credit card) should be at least \$1000. Compute the minimum payment on your credit card.
- (4) Construct a spreadsheet model for the amount you owe each month if you make the minimum payment. Use the monthly interest rate you determined in step 2. Subtract the minimum payment from the current balance, then add the interest to the amount owed to get the new amount owed. Repeat until the amount owed is less than \$10, then make a final payment to close out the account. Calculate the total amount paid divided by the amount borrowed initially.
- (5) Construct a spreadsheet model for the amount you owe each month if you pay 10% of the amount owed, instead of the minimum payment. Calculate the total amount paid divided by the amount borrowed initially. Prepare a graph showing both models, with clear information about when each would be paid off.
- (6) Use the credit calculator at  
<http://www.bankrate.com/calculators/credit-cards/credit-card-minimum-payment.aspx>  
to see how your model compares with theirs. Note that, for the credit card rate, you need to enter the annual rate, not the monthly rate.

I will assess this project as follows:

- I will assess the orator in C1 (oral communication). I expect a rehearsed presentation addressing the requirements in #3 on the first page.
- I will assess all group members in C2 (reading). All group members will receive the same grade for this. Each of you is responsible for producing an accurate model of your scenario and checking each other's work.
- I will assess the writer in C3 (written communication). I expect a well-written summary, including an introduction and a conclusion (think "essay") that addresses the requirements in #1 on the first page.
- I will assess the graphic artist in C4 (notation). I expect neatly drawn and/or printed out graphs meeting all requirements in #2 on the first page.
- I will assess all group members in C6 (collaboration). You might receive different grades based on your observed behavior in class during project work. Group members who do not waste time, do not argue, contribute fairly, and otherwise do their fair share of the work for the group will earn a 10. Group members who waste excessive time, do not do the work assigned by the group, and/or disrupt their own or other groups may earn a 4. Be careful: This is the only time that I will be assessing C6 this semester, and you will *not* be allowed to reassess.
- Students who are not paying attention and/or are disrespectful during students' presentations may receive a reduced evaluation in standards C1 and/or C6.